

THE BELL SYSTEM TECHNICAL JOURNAL

A JOURNAL DEVOTED TO THE
SCIENTIFIC AND ENGINEERING
ASPECTS OF ELECTRICAL
COMMUNICATION

EDITORIAL BOARD

F. B. JEWETT

A. F. DIXON

D. LEVINGER

H. P. CHARLESWORTH

O. E. BUCKLEY

M. J. KELLY

W. WILSON

W. H. HARRISON

O. B. BLACKWELL

H. S. OSBORNE

R. W. KING, *Editor*

J. O. PERRINE, *Associate Editor*

TABLE OF CONTENTS AND INDEX

VOLUME XVII

1938

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
NEW YORK

PRINTED IN U. S. A.

THE BELL SYSTEM TECHNICAL JOURNAL

VOLUME XVII, 1938

Table of Contents

JANUARY, 1938

New Transmission Measuring Systems for Telephone Circuit Maintenance— <i>F. H. Best</i>	1
The Impedance Concept and its Application to Problems of Reflection, Refraction, Shielding and Power Absorption— <i>S. A. Schelkunoff</i>	17
On the Theory of Space Charge Between Parallel Plane Electrodes— <i>C. E. Fay, A. L. Samuel and W. Shockley</i>	49
A Carrier Telephone System for Toll Cables— <i>C. W. Green and E. I. Green</i>	80
Cable Carrier Telephone Terminals— <i>R. W. Chesnut, L. M. Ilgenfritz and A. Kenner</i>	106
Crystal Channel Filters for the Cable Carrier System— <i>C. E. Lane</i>	125
Crosstalk and Noise Features of Cable Carrier Telephone System— <i>M. A. Weaver, R. S. Tucker and P. S. Darnell</i>	137
A New Single Channel Carrier Telephone System— <i>H. J. Fisher, M. L. Almquist and R. H. Mills</i>	162

APRIL, 1938

Studies of Telephone Line Wire Spacing Problems— <i>J. A. Carr and F. V. Haskell</i>	195
Variable Equalizers— <i>H. W. Bode</i>	229
An Explanation of the Common Battery Anti-sidetone Subscriber Set— <i>C. O. Gibbon</i>	245
The Occurrence and Effect of Lockout Occasioned by Two Echo Suppressors— <i>Arthur W. Horton, Jr.</i>	258
Characteristic Time Intervals in Telephonic Conversation— <i>A. C. Norwine and O. J. Murphy</i>	281
Radioactivity—Artificial and Natural— <i>Karl K. Darrow</i>	292

JULY, 1938

Hertz, the Discover of Electric Waves— <i>Julian Blanchard</i>	327
Instruments for the New Telephone Sets— <i>W. C. Jones</i>	338
Transmission Features of the New Telephone Sets— <i>A. H. Inglis</i>	358
Spectrochemical Analysis in Communication Research— <i>Beverly L. Clarke and A. E. Ruehle</i>	381
High Speed Motion Picture Photography— <i>W. Herriott</i>	393
An Optical Harmonic Analyzer— <i>H. C. Montgomery</i>	406
Magnetic Shielding of Transformers at Audio Frequencies— <i>W. G. Gustafson</i>	416
Coaxial Cable System for Television Transmission— <i>M. E. Strieby</i>	438
Stabilized Feedback Oscillators— <i>G. H. Stevenson</i>	458
The Discovery of Electron Waves— <i>C. J. Davisson</i>	475

OCTOBER, 1938

Ultra-Short-Wave Transmission and Atmospheric Irregularities— <i>C. R. Englund, A. B. Crawford and W. W. Mumford</i>	489
Amplitude Range Control— <i>S. B. Wright</i>	520
Devices for Controlling Amplitude Characteristics of Telephonic Signals— <i>A. C. Norwine</i>	539
The Exponential Transmission Line— <i>Chas. R. Burrows</i>	555
The Bridge Stabilized Oscillator— <i>L. A. Meacham</i>	574
Effect of Space Charge and Transit Time on the Shot Noise in Diodes— <i>A. J. Rack</i>	592
Fundamentals of Teletypewriters Used in the Bell System— <i>E. F. Watson</i>	620
The Dielectric Properties of Insulating Materials— <i>E. J. Murphy and S. O. Morgan</i>	640

Index to Volume XVII

A

- Almquist, M. L., H. J. Fisher and R. H. Mills*, A New Single Channel Carrier Telephone System, page 162.
Amplitude Characteristics of Telephonic Signals, Devices for Controlling, A. C. Norwine, page 539.
Amplitude Range Control, S. B. Wright, page 520.
Analyzer, An Optical Harmonic, H. C. Montgomery, page 406.
Anti-sidetone Subscriber Set, Common Battery, An Explanation of the, C. O. Gibbon, page 245.

B

- Best, F. H.*, New Transmission Measuring Systems for Telephone Circuit Maintenance, page 1.
Blanchard, Julian, Hertz, the Discoverer of Electric Waves, page 327.
Bode, H. W., Variable Equalizers, page 229.
Burrows, Chas. R., The Exponential Transmission Line, page 555.

C

- Cable Carrier System, Crystal Channel Filters for the, C. E. Lane*, page 125.
Cable Carrier Telephone System, Crosstalk and Noise Features of, M. A. Weaver, R. S. Tucker and P. S. Darnell, page 137.
Cable Carrier Telephone Terminals, R. W. Chesnut, L. M. Ilgenfritz and A. Kenner, page 106.
Cable System for Television Transmission, Coaxial, M. E. Strieby, page 438.
Cables, Toll, A Carrier Telephone System for, C. W. Green and E. I. Green, page 80.
Carr, J. A. and F. V. Haskell, Studies of Telephone Line Wire Spacing Problems, page 195.
Carrier Telephone System for Toll Cables, A. C. W. Green and E. I. Green, page 80.
Carrier Telephone System, Cable, Crosstalk and Noise Features of, M. A. Weaver, R. S. Tucker and P. S. Darnell, page 137.
Carrier Telephone System, A New Single Channel, H. J. Fisher, M. L. Almquist and R. H. Mills, page 162.
Chesnut, R. W., L. M. Ilgenfritz and A. Kenner, Cable Carrier Telephone Terminals, page 106.
Clarke, Beverly L. and A. E. Ruehle, Spectrochemical Analysis in Communication Research, page 381.
Coaxial Cable System for Television Transmission, M. E. Strieby, page 438.
Crawford, A. B., C. R. Englund and W. W. Mumford, Ultra-Short-Wave Transmission and Atmospheric Irregularities, page 489.
Crystal Channel Filters for the Cable Carrier System, C. E. Lane, page 125.

D

- Darnell, P. S., M. A. Weaver and R. S. Tucker*, Crosstalk and Noise Features of Cable Carrier Telephone System, page 137.
Darrow, Karl K., Radioactivity—Artificial and Natural, page 292.
Davison, C. J., The Discovery of Electron Waves, page 475.
Dielectric Properties of Insulating Materials, The, E. J. Murphy and S. O. Morgan, page 640.
Diodes, Effect of Space Charge and Transit Time on the Shot Noise in, A. J. Rack, page 592.

E

- Echo Suppressors, Two, The Occurrence and Effect of Lockout Occasioned by, Arthur W. Horton, Jr.*, page 258.

- Electric Waves, Hertz, the Discoverer of, *Julian Blanchard*, page 327.
 Electron Waves, The Discovery of, *C. J. Davison*, page 475.
Englund, C. R., A. B. Crawford and W. W. Mumford, Ultra-Short-Wave Transmission and Atmospheric Irregularities, page 489.
 Equalizers, Variable, *H. W. Bode*, page 229.

F

- Fay, C. E., A. L. Samuel and W. Shockley*, On the Theory of Space Charge between Parallel Plane Electrodes, page 49.
 Feedback Oscillators, Stabilized, *G. H. Stevenson*, page 458.
 Filters, Crystal Channel, for the Cable Carrier System, *C. E. Lane*, page 125.
Fisher, H. J., M. L. Almquist and R. H. Mills, A New Single Channel Carrier Telephone System, page 162.

G

- Gibbon, C. O.*, An Explanation of the Common Battery Anti-sidetone Subscriber Set, page 245.
Green, C. W. and E. I., A Carrier Telephone System for Toll Cables, page 80.
Gustafson, W. G., Magnetic Shielding of Transformers at Audio Frequencies, page 416.

H

- Haskell, F. V. and J. A. Carr*, Studies of Telephone Line Wire Spacing Problems, page 195.
Herriott, W., High Speed Motion Picture Photography, page 393.
 Hertz, the Discoverer of Electric Waves, *Julian Blanchard*, page 327.
Horton, Arthur W., Jr., The Occurrence and Effect of Lockout Occasioned by Two Echo Suppressors, page 258.

I

- Ilgenfritz, L. M., R. W. Chesnut and A. Kenner*, Cable Carrier Telephone Terminals, page 106.
 Impedance Concept and its Application to Problems of Reflection, Refraction, Shielding and Power Absorption, *The, S. A. Schelkunoff*, page 17.
Inglis, A. H., Transmission Features of the New Telephone Sets, page 358.
 Insulating Materials, The Dielectric Properties of, *E. J. Murphy and S. O. Morgan*, page 640.

J

- Jones, W. C.*, Instruments for the New Telephone Sets, page 338.

K

- Kenner, A., R. W. Chesnut and L. M. Ilgenfritz*, Cable Carrier Telephone Terminals, page 106.

L

- Lane, C. E.*, Crystal Channel Filters for the Cable Carrier System, page 125.

M

- Magnetic Shielding of Transformers at Audio Frequencies, *W. G. Gustafson*, page 416.
 Maintenance, Telephone Circuit, New Transmission Measuring Systems for, *F. H. Best*, page 1.
Meacham, L. A., The Bridge Stabilized Oscillator, page 574.
Mills, R. H., H. J. Fisher and M. L. Almquist, A New Single Channel Carrier Telephone System, page 162.
Montgomery, H. C., An Optical Harmonic Analyzer, page 406.
Morgan, S. O. and E. J. Murphy, The Dielectric Properties of Insulating Materials, page 640.
 Motion Picture Photography, High Speed, *W. Herriott*, page 393.

- Mumford, W. W., C. R. Englund and A. B. Crawford, Ultra-Short-Wave Transmission and Atmospheric Irregularities, page 489.
 Murphy, E. J. and S. O. Morgan, The Dielectric Properties of Insulating Materials, page 640.
 Murphy, O. J. and A. C. Norwine, Characteristic Time Intervals in Telephonic Conversation, page 281.

N

- New Telephone Sets, Instruments for the, W. C. Jones, page 338.
 New Telephone Sets, Transmission Features of the, A. H. Inglis, page 358.
 Norwine, A. C., Devices for Controlling Amplitude Characteristics of Telephonic Signals, page 539.
 Norwine, A. C. and O. J. Murphy, Characteristic Time Intervals in Telephonic Conversation, page 281.

O

- Oscillator, The Bridge Stabilized, L. A. Meacham, page 574.
 Oscillators, Stabilized Feedback, G. H. Stevenson, page 458.

R

- Rack, A. J., Effect of Space Charge and Transit Time on the Shot Noise in Diodes, page 592.
 Radio: Ultra-Short-Wave Transmission and Atmospheric Irregularities, C. R. Englund, A. B. Crawford and W. W. Mumford, page 489.
 Radioactivity—Artificial and Natural, Karl K. Darrow, page 292.
 Research, Communication, Spectrochemical Analysis in, Beverly L. Clarke and A. E. Ruehle, page 381.
 Ruehle, A. E. and Beverly L. Clarke, Spectrochemical Analysis in Communication Research, page 381.

S

- Samuel, A. L., C. E. Fay and W. Shockley, On the Theory of Space Charge between Parallel Plane Electrodes, page 49.
 Schelkunoff, S. A., The Impedance Concept and its Application to Problems of Reflection, Refraction, Shielding and Power Absorption, page 17.
 Shockley, W., C. E. Fay and A. L. Samuel, On the Theory of Space Charge between Parallel Plane Electrodes, page 49.
 Short-Wave, Ultra-, Transmission and Atmospheric Irregularities, C. R. Englund, A. B. Crawford and W. W. Mumford, page 489.
 Shot Noise in Diodes, Effect of Space Charge and Transit Time on the, A. J. Rack, page 592.
 Space Charge between Parallel Plane Electrodes, On the Theory of, C. E. Fay, A. L. Samuel and W. Shockley, page 49.
 Space Charge and Transit Time on the Shot Noise in Diodes, Effect of, A. J. Rack, page 592.
 Spectrochemical Analysis in Communication Research, Beverly L. Clarke and A. E. Ruehle, page 381.
 Stevenson, G. H., Stabilized Feedback Oscillators, page 458.
 Strieby, M. E., Coaxial Cable System for Television Transmission, page 438.

T

- Telephonic Signals, Devices for Controlling Amplitude Characteristics of, A. C. Norwine, page 539.
 Teletypewriters Used in the Bell System, Fundamentals of, E. F. Watson, page 620.
 Television Transmission, Coaxial Cable System for, M. E. Strieby, page 438.
 Time Intervals in Telephonic Conversation, Characteristic, A. C. Norwine and O. J. Murphy, page 281.
 Transformers at Audio Frequencies, Magnetic Shielding of, W. G. Gustafson, page 416.
 Transmission Features of the New Telephone Sets, A. H. Inglis, page 358.
 Transmission Line, The Exponential, Chas. R. Burrows, page 555.

- Transmission Measuring Systems for Telephone Circuit Maintenance, New, *F. H. Best*, page 1.
Tucker, R. S., M. A. Weaver and P. S. Darnell, Crosstalk and Noise Features of Cable Carrier Telephone System, page 137.

W

- Watson, E. F.*, Fundamentals of Teletypewriters Used in the Bell System, page 620.
Weaver, M. A., R. S. Tucker and P. S. Darnell, Crosstalk and Noise Features of Cable Carrier Telephone System, page 137.
Wire Spacing Problems, Telephone Line, Studies of, *J. A. Carr and F. V. Haskell*, page 195.
Wright, S. B., Amplitude Range Control, page 520.

